The Applicants affirm the previous election to prosecute claims 1-8 and 10-16. Accordingly, claims 9 and 17-20 have been canceled without prejudice. The Applicants reserve the right to file a divisional application based on the canceled claims.

By the office action, the Examiner objected to the drawings under 37 CFR 1.84(p)(5), stating that the reference sign 22 in FIG. 5 is not mentioned in the description. The specification has been amended to add "22" at the appropriate location. No new matter has been added. Reconsideration of the objection is earnestly solicited.

By the office action, claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,913,149 to Thakur et al. (hereinafter Thakur) in combination with U.S. Patent No. 4,940,505 to Schachameyer et al. (hereinafter Schachameyer).

The Examiner stated that Thakur disclosed depositing an amorphous silicon nitride layer over the crystalline nitride layer (col. 5, line 25). The Applicants respectfully disagree with the rejection.

The present invention, as set forth in amended claim 1, includes, *inter alia*, a method for forming a crystalline silicon nitride layer, [by] providing a crystalline silicon substrate with an exposed precleaned surface, removing a native oxide from the exposed surface, precleaning the exposed surface by employing a hydrogen prebake a predetermined amount of time after the removing step and exposing the exposed surface to nitrogen to form a crystalline silicon nitride layer. Although the Applicants believe that the originally filed claims are allowable over the cited art, claims 1 and 10 have been amended to further clarify the distinctions of the present invention. The present invention forms a crystalline silicon nitride layer on a crystalline silicon substrate by first cleaning the silicon substrate's surface and then performing a hydrogen prebake process after a predetermined time.

The cited combination of Thakur and Schachameyer fails to disclose or suggest the present invention as claimed. The Examiner stated that Thakur does not disclose the precleaning by hydrogen bake, as set forth in the present invention, but that Schachameyer does. However, neither reference alone or in combination discloses a crystalline silicon nitride layer, and while both references clean a substrate neither reference provides process steps for forming a crystalline silicon nitride layer.

Thakur forms only an amorphous silicon nitride layer (see Col. 5, lines 31-35). Thakur employs chemical vapor deposition (CVD, LPCVD, etc.) and thermally grown processes (RTN) as described at col. 5, lines 15-36 in Thakur and also described in the "Background of the Invention" of the present disclosure (see e.g., pages 2, lines 7-17). These processes are known in the art to form amorphous silicon nitride layers (see col. 5, lines 15-36 of Thakur).

Furthermore, Schachameyer is directed to forming a crystalline silicon layer not crystalline silicon nitride. These materials and processes are completely different. Further, the process described by Schachameyer uses an excimer laser to excite hydrogen molecules to clean a surface. No silicon nitride layers are suggested. The cleaning process of Schachameyer employs an excimer (UV) laser on hydrogen gas to clean a surface for forming a silicon crystal layer. Schachameyer states that, " the reaction relies upon photolytic activation by the laser ... to reduce the hydrogen to atomic hydrogen" (see col. 3, lines 15-18 of Schachameyer). This process is completely different from the present invention, although hydrogen is employed in both cases.

The Applicants respectfully submit that even if the references are combined, all of the elements of the presently claimed invention are not shown or suggested. Although both Schachameyer and Thakur disclose cleaning a surface, neither reference, alone or in combination, discloses or suggests forming a crystalline silicon nitride layer, by providing a crystalline silicon

substrate with an exposed surface, removing a native oxide from the exposed surface, precleaning the exposed surface by employing a hydrogen prebake a predetermined amount of time after the removing step and exposing the exposed surface to nitrogen to form a crystalline silicon nitride layer. The steps provided in accordance with the present invention advantageously provide a crystalline silicon nitride layer. Even if combined, Schachameyer and Thakur disclose only variations on cleaning a silicon surface and fail to disclose or suggest forming a silicon nitride crystalline layer. A practitioner combining these references would be able to form an amorphous silicon nitride layer on a cleaned silicon surface; however, the practitioner would not be able to form a crystalline silicon nitride layer as taught by the present invention.

The Examiner suggests that the process combination would result in formation of crystalline silicon because the same materials would be treated in the same manner as in the instant invention, or that the nitridation conditions are routine optimizations. However, the present invention removes native oxide, and performs a hydrogen prebake a predetermined time after the removing step, then exposes the surfaces of the silicon crystal substrate to form a crystalline silicon nitride layer. Thakur seeks to avoid pin hole leakage through amorphous films and employs chemical vapor deposition (CVD, LPCVD, etc.) and thermally grown processes (RTN) in combination, as described at col. 5, lines 15-36 in Thakur, and also described in the "Background of the Invention" of the present disclosure (see e.g., pages 2, lines 7-17). These processes are known in the art to form amorphous silicon nitride layers, as described at col. 5, lines 15-36 of Thakur. In addition, Schachameyer does not disclose or suggest silicon nitride layers. Even if the cleaning process Schachameyer is combined with the deposition processes of Thakur, a crystalline silicon nitride layer would not be formed since the disclosed processes of Thakur form only an amorphous silicon nitride layer as is known in the art. Accordingly, the

Applicants respectfully disagree with the Examiner's contentions. Claims 1-8 are believed to be allowable over the cited art for at least the reasons stated. Reconsideration of the rejection is respectfully requested.

By the office action, claims 10-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Thakur in combination with Schachameyer and further in view of Wolf, Vol. 2. page 51. The Examiner stated that the Wolf, Vol. 2 discloses a capacitor in a trench. The Applicants respectfully disagree with the rejection.

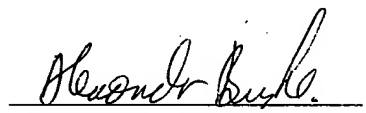
Amorphous silicon nitride node dielectric layers are taught in the art. However, page 51 of Wolf does not teach or suggest such a structure. Instead, the structure disclosed at page 51 is an isolation region formed between transistor devices to provide the three major purposes described by the Examiner. Notwithstanding these deficiencies, Wolf, Vol. 2 fails to cure the deficiencies of Thakur in combination with Schachameyer. None of the cited references, alone or in combination, disclose or suggest crystalline silicon nitride or methods for forming the same.

Since the combination of references fails to disclose or suggest, *inter alia*, forming a crystalline silicon nitride layer, by providing a crystalline silicon substrate with an exposed precleaned surface, removing a native oxide from the exposed surface, precleaning the exposed surface by employing a hydrogen prebake a predetermined amount of time after the removing step, and exposing the exposed surface to nitrogen to form a crystalline silicon nitride layer, the present invention is believed to be in condition for allowance. Claims 10-16 are believed to be allowable over the cited art for at least the reasons stated. Reconsideration of the rejection is respectfully requested.

In view of the foregoing amendments and remarks, it is respectfully submitted that all the claims now pending in the application are in condition for allowance. Early and favorable

reconsideration of the case is respectfully requested.

Respectfully submitted,

By: 

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